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The Economic Survey for 1948

Sir Arthur Smout, J.P., in his Presidential Address to the 40th annual meeting of the Institute of Metals, deemed it wise to recall the early history of the Institute and in doing so paid tribute to the founders and the support of the Press. The Press at that time showed wider vision than some of the pioneers. We were pleased to read of this recognition of the part played by the technical Press in not only paving the way for the creation of learned societies, but also of their continuous loyal and enlightened support. This feature is occasionally forgotten by those who desire to obtain some fleeting kudos for their pet institution.

Sir Arthur struck a new note in advocating, as a potential solution of many production troubles, the more general utilisation of continuous working. Yet if he desires confirmation other than his reference to heavy chemicals, he has but to examine the results achieved by the steel industry since the week-end shut-down was suppressed. Whilst his dictum could only apply to certain sections of the foundry industry, it has already shown promise in such plant as the continuous annealing of malleable.

The new president has re-stated the real objects of a learned society—that is, "to collect facts, analyse them and interpret them in terms of works' technique." For this to be effective, the membership must be representative of the whole of those who deal with technology—in the widest sense of the term—in order that the sum of the implications of new data can be interpreted rationally. With the tools and knowledge now available to science and industry, the gap between discovery and application can be materially lessened. The "dumbness" of the "big-wigs" in taking up new ideas is a generalisation which, as the president points out, should not be taken for granted. A businessman, strange to relate, is in business for business, and is not there to risk the jobs of his men or the money of his shareholders in adventures of a revolutionary character. His policy must be evolutionary. Into which category any new proposal may fall is for his decision and his alone. Obviously, such rulings will depend in the main on the ability of his technical advisers to present any scheme of a revolutionary nature in such a manner that by its very simplicity it seems a sensible and quite ordinary step to take. Technical advisers can only ascertain the implications of new things by ascertaining the opinions of all those multitudinous technicians, whose experience in allied fields can contribute so much. He can only learn of their existence by the reputations established through their writings or verbal contributions to learned societies or the technical Press. Sir Arthur's quotation of a remark by Dr. Rochester, of the University of Nebraska, sets the seal on the "New Look" of learned societies. The quotation reads: "I do not recall that I have ever known a person, who has stood high in his business or profession, who has not actively affiliated himself with organisations, attended meetings and read magazines connected with his affairs. These seem to be the ways in which people keep up to date and alert to the new things which are going on." We sincerely appreciate Sir Arthur's presidential address, for it has well stressed the important part which the learned societies and the technical Press play in the make-up of a modern world.

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Building Trades Exhibition

Over 100 leading firms in the building industry are exhibiting in the City Hall, Deansgate, Manchester, at the first post-war Builders' Exhibition.

The opening ceremony will be performed at 11 a.m. on Tuesday, April 6, by the Minister of Works, the Rt. Hon. Alderman Charles W. Key, M.P., with the Lord Mayor of Manchester, Miss Mary Kingsmill Jones, O.B.E., J.P., in the chair.

Features of the Exhibition are a Wates pre-cast house specially built and fully furnished, and a large display by the Manchester Education Committee Building Trades School, showing different sections of Craft Training with students actually at work.

Architects and builders interested in the exhibits should apply for complementary tickets to Provincial Exhibitions, Limited, City Hall, Deansgate, Manchester. The Exhibition will remain open from 11 a.m. to 9 p.m. until Saturday, April 17. Public admission 1s. 6d.

New Foundry at Kington

Many years ago Kington, Herefordshire, was noted for its ironfoundry, but circumstances changed, and it went out of production. After a lapse of about 25 years, a new foundry has been erected in the same quarter of the town. Recently the new foundry came into "life," as the cupola was lighted for the first time, and trial melts and castings were made.

The principal building has been fitted with an overhead gantry for a crane. Another building will be used for castings in non-ferrous metals. The output will include manhole covers (an order is booked for export), electric motor pulleys, and items for the local trade, which is mainly concerned with agriculture.

The chairman of the directors of the Kington Foundries (Hereford), Limited, Mr. C. E. Tabin, who attended the first cast, said that their first concern was to manufacture for export. Iron castings will be quickly put into production, a start being made with a small staff of experienced hands to train local labour. It was the firm's intention, he said, to make castings in iron and non-ferrous metals for agricultural mining, general engineering, housing and local authority's requirements. He spoke of the assistance and support they had received from the Board of Trade, Ministry of Supply, and the Kington Urban Council, and he hoped that the industry would be a valuable asset to the district.

When fully completed, the scheme includes offices, messroom, and all amenities. Fluorescent lighting will be used for lighting the foundry. Land is available for extensions.

AT A WELL-ATTENDED MEETING of the Southern Section of the Institute of Vitreous Enamellers, held recently at the Charing Cross Hotel, London, under the presidency of Mr. C. P. Stone (President of the Institute), the Paper "Gas Consumer Demands of the Enameller" was given by E. W. B. Dunning, B.Sc. The Paper stressed the importance of set standards of quality which were demanded of enamellers by the gas-supply authorities on behalf of their customers for appliances. Its presentation was followed by an interesting discussion.

Forthcoming Events

(Secretaries are invited to send in notices of meetings, etc., for inclusion in this column.)

MARCH 31.

Institute of British Foundrymen.

London Branch:—"Production Planning for the Foundry," by W. A. Turner, at the Waldorf Hotel, Aldwych, London, W.C.2, at 7.30 p.m.

APRIL 1.

Leeds Metallurgical Society

"Controlled Atmospheres," by I. Jenkins, at 7 p.m., at the Chemistry Department, the University, Leeds, 2.

Royal Statistical Society—Industrial Applications Section

Sheffield Branch:—"The Application of Quality Control to a Steel Strip Mill," by G. Komlosy, at the Department of Applied Science, the University, Sheffield, at 6.30 p.m.

APRIL 2.

Institute of British Foundrymen.

Birmingham, Coventry and West Midlands Branch:—Annual Dinner and Dance at the Wulfruna Hall, Wolverhampton, at 7 p.m.

APRIL 3.

Institution of Production Engineers.

Luton and District Graduate Section:—"Research and Practice," by Dr. D. F. Galloway, B.Sc. Hons., Wh.Sc., at P.E.R.A. Laboratories, Melton Mowbray.

Institute of British Foundrymen.

Lancashire Branch:—Annual General Meeting and "Making a Turbine Case for Hydro-Electric Plant," by T. Rigby, at the Engineers' Club, Albert Square, Manchester, at 3 p.m.

East Midlands Branch:—Annual General Meeting and Short Paper Competition, at the School of Arts and Crafts, Green Lane, Derby, at 6 p.m.

Wales and Monmouth Branch:—Works visit to W. A. Baker and Company, Limited, Westgate Ironworks, Newport, Mon, at 2.30 p.m., followed by presentation of Winning Papers in the competition for young members at a meeting in the works' canteen.

Notes from the Branches

Newcastle-upon-Tyne

Appreciation of the policy pursued by the Newcastle Branch in arranging visits to works in the area was shown by the attendance of over 80 members on the occasion of their visit to the Wallsend Works of the North Eastern Marine Engineering Company, Limited, on Saturday, March 13. They were welcomed by Mr. C. Gresty, representing the management. Split up into parties, and led by efficient guides, they were taken over the whole of the works. Though not able to see the foundry sections in operation, they watched the machining of marine engine details in the shops that were working.

The main general points upon which members favourably commented were the height and spaciousness of the shops and the excellent natural lighting, particularly in the foundries, as well as the orderliness and cleanness of the shops. The extensive modern equipment of the laboratories was also much admired.

In the canteen, where light refreshments were served, the President, Mr. W. Redmayne, proposed, and Mr. S. Unsworth seconded, a vote of thanks to the directors of the company, which was carried with acclamation, and Mr. Gresty was asked to convey these thanks to the directors.

Impurities in Steelfoundry Knock-out Sand

★

Their Effect on the Surfaces of Castings

★

By H. E. Crivan, B.Sc., A.R.T.C., A.R.I.C., F.I.M.*

Most foundries attempt to reclaim a proportion of their knock-out or floor sand, for use again, either as backing or facing sand, or both. The actual proportions of floor sand reclaimed vary tremendously from one foundry to another, depending on various factors; among these may be mentioned the quality of metal used, *i.e.*, whether plain or alloy steels, cast iron, or non-ferrous alloys. The effect of the molten metal on the sand will be greater when using a high-alloy steel than when dealing with, say, plain cast iron, and the latter should therefore normally allow of a greater amount of floor sand being recovered. Indeed, Thomas[1] believes that the use of reclaimed sand is actually beneficial with cast iron, and that new sand additions should be kept down to the minimum.

Hot Strength

Other factors determining the use of old sand are section thickness, weight, and possibly design of casting. One may refer to the remarks made by the author[2] in a previous article, with regard to the hot strength of floor sand, in which it was found that because of its lower refractoriness, it exhibited higher hot strength than the various mixtures of new sands which had been tested. This greater hot strength may be beneficial from the point of view of preventing scabbing, but would be liable to create a greater tendency to hot-tearing, especially with steel castings. It was also pointed out elsewhere[3] that under standard conditions of casting, floor sand gave rise to the roughest surface, when compared to natural moulding or synthetic sands. The metal used was low-alloy steel of fairly light section. From a technical aspect, therefore, the use of floor sand, particularly for facing purposes, requires a great deal of consideration, and should be approached cautiously, although the ultimate results of one's experience may lead to a very high percentage of reclaimed sand being used in the foundry.

The use of floor sand will also be determined by the presence or absence of a sand-reclamation plant, and the system of reclamation used. This is bound up with the impurities found in the knock-out sand. The main points to be considered are the amount and type of impurities present, their effect on the castings, and the efficiency with which they can be removed. Other factors bearing on the subject of reclamation are cost, and the relative price of the sand mixtures to the cost of the final casting. If the cost of the sand is small compared with that of the castings, reclamation will not have the same significance from a cost point of view as it would if the sand were a comparatively expensive item. With plain cast iron, therefore, the cost of sands will be of much greater moment than with, say, stainless or austenitic steels, or with non-ferrous alloys. In fact, in many light-casting ironfoundries, extensive sand reclamation is an economic necessity.

The quality of the new sands used in the foundry will also have a direct bearing on the proportion of sand that can be recovered, because a superior, high-grade, well-bonded and highly refractory sand, used

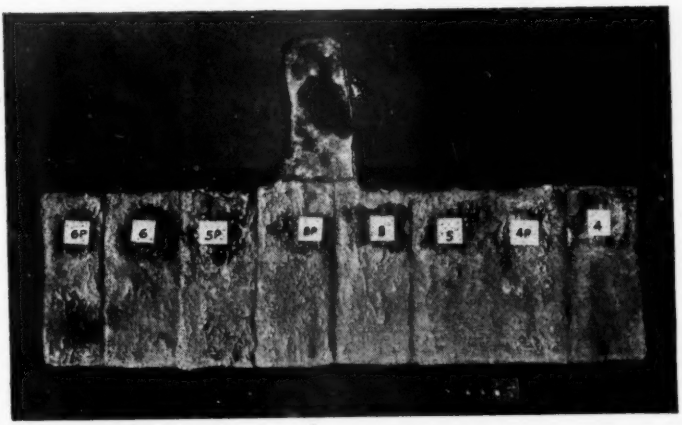

FIG. 1.—SOME OF THE TEST CASTINGS USED IN THE INVESTIGATIONS, DESIGNATED AS FOLLOWS:—

(4) Unburned brown rock sand; (4P) as (4), but painted with silica wash; (5) rock stone; (5P), as (5), but painted with silica wash; (6) brick lumps, and (6P), as (6), but treated with silica wash; (B) and (BP) are impurity-free cores used to protect the others.

*Clyde Alloy Steel Company, Limited, Motherwell.

Impurities in Knock-out Sand

in the first cycle of operations, will facilitate re-use much more than will a virgin sand of inferior refractoriness and bonding power.

One can refer, generally, to another aspect of the situation—the facilities for disposal of old sand and the availability of suitable new sands. Labour and transport problems are much greater to-day than before the war, and therefore there is a constantly increasing tendency in the foundry industry, generally, to employ greater quantities of old sand than previously. Wells and Johnson,[4] in considering the problems and development of a wartime steelfoundry, refer to this problem, and stress the necessity for use and control of old sand. The above considerations suggest that close examination, study and control of floor sand are as important as for new materials.

Qualitative Examination of Knock-out Sand Impurities Found

The Author recorded every type of impurity which could be found in sand at the knock-out of a foundry engaged in making dry-sand castings, varying from about two hundredweights to about twenty tons; the findings are here given. No claim is made as to the completeness of the list, the impurities being simply those obtained in one particular foundry, it being fully realised that different results might be obtained in other foundries. It should be borne in mind, when considering the results of this investigation, that some of the impurities are only present in negligible amounts, and others are only of occasional occurrence.

(1) *Baked Clay Lumps.*—These are lumps of clay from the moulding sand, which have been baked at some stage into a hard, compact mass.

(2) *Burned Brown Rock Sand.*—Present as hard lumps in the raw moulding sand, having undergone partial burning.

(3) *Burned White Rock Sand.*—Similar to (2), except that the material is snow-white in colour.

(4) *Unburned Rock Sand.*—Lumps of rock which have only been dried, and are not as hard as (2) and (3). They break down more easily.

(5) *Rock Stone.*—Very hard lumps, not originating from the sand, but entering the sand heaps from other sources.

(6) *Brick Lumps.*—Chippings from bricks, which have been used in moulding for making risers.

(7) *Concrete.*—Lumps of concrete,* sometimes containing large particles of coke, are liable to enter the sand system.

(8) *Fused Slag.*—Usually dark green in colour; originates from the pouring ladle.

(9) *Steel Shot.*—From the splashing of the steel during pouring.

(10) *Iron and Steel Scrap.*—Iron and steel used in moulding, *e.g.*, nails, sprigs, etc., entering the sand during the knock-out process.

*The few lumps of concrete which had entered the floor sand originated from the foundry floor which had lately been broken up, due to alterations to the foundry.

TABLE I.—*Mechanical Analysis of Impurities Found in Knock-Out Sand.*

No. of sample.	Weight of sample, lbs.	Size of fraction.	Percentage on each riddle.	Classification of impurities found on each riddle.							Total.
				Iron	Ash	Coke	Coal	Brick	Frit	Slag	
1	46	On ½-in.	25.3	10.8	5.1	8.7	0.2	0.7	2.0	0.5	28.0
		On ¼-in.	3.3	1.6	12.6	9.0	6.5	2.5	8.1	0.6	40.9
		On ⅛-in.	4.4	High pr	oportion	of impuri	ties, size	too small	to classi	fy.	
		Through ⅛-in. ..	67.0	Very sm	all amou	nt of imp	urities, p	rincipally	sand.		
2	40	On ½-in.	64.6	2.6	Nil	Nil	Nil	Nil	0.6	Nil	3.2
		On ¼-in.	1.3	Nil	Nil	Nil	Nil	Nil	16.7	Nil	16.7
		On ⅛-in.	2.4								
		Through ⅛-in. ..	31.7	Same re	marks ap	ply as for	sample	1.			
3	37	On ½-in.	62.1	1.1	0.6	1.4	0.1	Nil	0.8	1.1	5.1
		On ¼-in.	1.6	Nil	22.0	35.2	11.0	Nil	1.5	5.8	75.5
		On ⅛-in.	3.2								
		Through ⅛-in. ..	33.1	Same re	marks as	for previ	ous samp	les.			
4	34	On ½-in.	42.6	Nil	Nil	Nil	Nil	Nil	2.1	Nil	2.1
		On ¼-in.	21.9	66.5	Nil	Nil	Nil	1.7	7.1	Nil	74.3
		On ⅛-in.	4.3								
		Through ⅛-in. ..	33.3	As for p	revious s	amples.					
5	39	On ½-in.	45.2	2.6	0.2	Nil	0.5	0.2	3.8	Nil	7.3
		On ¼-in.	2.1	Nil	7.2	9.2	Nil	Nil	27.2	Nil	43.6
		On ⅛-in.	3.7								
		Through ⅛-in. ..	49.0	As for p	revious s	amples.					
6	41	On ½-in.	56.2	61.5	Nil	Nil	0.03	Nil	0.6	Nil	62.1
		On ¼-in.	1.2	1.7	3.0	Nil	1.3	Nil	40.6	Nil	46.6
		On ⅛-in.	3.1								
		Through ⅛-in. ..	39.5	As for p	revious s	amples.					

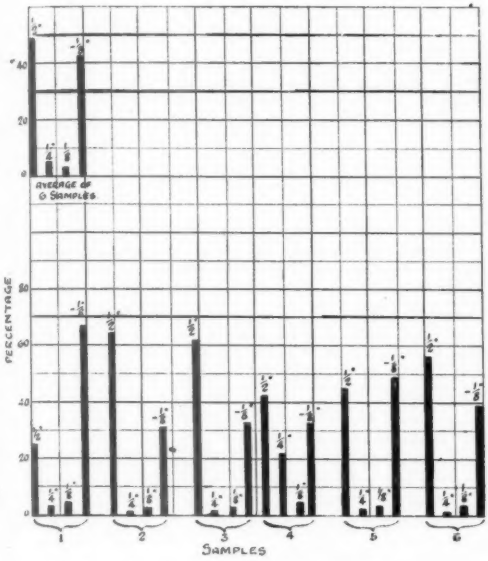

FIG. 2.—MECHANICAL ANALYSIS OF KNOCK-OUT SAND—PERCENTAGES FOUND ON ½-IN. AND ¼-IN. RIDDLES, AND ON AND THROUGH A ⅛-IN. SIEVE.

(11) *Coal Lumps.*—Originate from the centre of large cores where ashes are used. They vary in nature from fresh unburned coal to almost completely decomposed coal.

(12) *Coke.*—From the same source as (11).

(13) *Fused Coal Ash.*—From the centre of large cores.

(14) *Sand Frit (from Steel Face).*—Hard lumps of sand, fritted and slightly fused. Having been in contact with molten steel, this material will contain iron oxide and silicate. With high-manganese steel castings, manganese silicate will also be present.

(15) *Sand Frit (away from Steel Face).*—Lumps of sand which have not been in contact with the molten steel, but which have been slightly fritted to form a compact cake, usually dark grey in colour. The clay bond is completely destroyed, and there is no contamination by the steel.

(16) *Unbaked Clay Lumps.*—Sometimes fairly large lumps of green clay are to be found. These are undesirable, as a defective surface may be obtained on the casting if the lumps come into contact with the molten steel. They can originate either from the raw moulding sand or can be due to improper mixing in the sand mill.

(17) *Burned Oil-sand Lumps.*—From any oil-sand cores present.

Deliberate Inclusion of Impurities in Cores

The next stage in this investigation was to determine the effect of sand impurities on the surface of cast steel. For this purpose, small cores were moulded in sand, 4 in.. by 1½ in. in area and ¼ in. thick. One of each of the impurities was selected, approximately 1 in. by ½ in. in area, and pressed into a core so as to appear flush with the surface. Duplicate cores were also made containing the several impurities, but painted over with silica wash. The effects of the impurity on contact with the surface of the steel, and when covered with a protective refractory wash, could thus be compared. The cores were then dried at 200 deg. C. for two hours, and placed in sets of three (six cores in all, with duplicates) at the foot of moulds, 12 in. by 4 in. in area by 4 in. deep. This length of 12 in. in the mould enabled three experimental cores to be placed on each side of the runner, leaving room for two cores (without impurities) to be placed directly opposite the runner. There were five such moulds, each made in dry sand, with runner at the foot of the centre of the mould, and with open top.

Mild steel was used, poured at a temperature of 1,500 deg. C. The mould, being 4 in. high, enabled a ferrostatic head of 4 in. of liquid steel, together with the atmospheric pressure, to be applied to the sets of cores on the bottom.

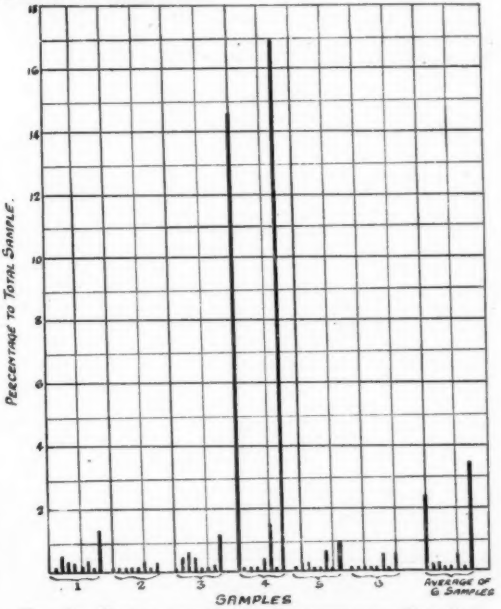

FIG. 3.—KNOCK-OUT SAND—QUANTITATIVE CLASSIFICATION OF IMPURITIES FOUND ON ½-IN. RIDDLE.

Impurities in Knock-out Sand

Other cores containing no impurities were placed directly opposite the runner, in order to receive the full force of the molten steel, and so to protect the experimental cores from undue erosion. All the surfaces were examined, with the results as set out below. To illustrate the types of defect encountered and the standard of judgment involved, some of the test castings are shown in Fig. 1.

(1) *Baked Clay Lumps.*—Very faint penetration of steel, giving slight roughness in the centre of the specimen, where the impurity was placed; no roughness when painted.

(2) *Burned Brown Rock Sand* (*Lump*).—Trace of slag, and small lump on the surface of the steel; sound surface when painted.

(3) *Unburned White Rock Sand* (*Lump*).—No action, either with or without painting.

(4) *Unburned Brown Rock Sand* (*Lump*).—Action very faint, trace of roughness; results unaffected by painting.

(5) *Rock Stone.*—Definite reaction, surface slightly rough; after painting, no marked effect.

(6) *Brick Lumps.*—Some fusion of the surface of the brick, steel slightly rough; after painting there was faint roughness, but surface had been more or less protected by the paint.

(7) *Concrete.*—This impurity was almost completely decomposed by the action of the steel and the surface was scabbed; painting exercised a great protective influence and the surface was only faintly marked.

TABLE II.—*Classification of Material Found on the ¼-in. Riddle.*

	On ¼-in. riddle, per cent.	Percentage of whole sand fraction.
Iron	13.1	6.90
Ash	1.0	0.29
Coke	1.7	0.51
Coal	0.14	0.06
Brick	0.15	0.05
Frit	1.65	0.73
Slag	0.27	0.13
Total	18.01	8.67

(8) *Burned White Rock Sand* (*Lump*).—Slight fusion of the impurity; small lump on steel surface, but no slagging; a paint wash gave complete protection to the surface.

(9) *Fused Slag.*—This impurity fused badly, forming a slag, and showed a large hole in the sand frit; large scab on steel face. The painted specimen showed a smaller hole in the sand frit, due to less slagging; steel surface only slightly scabbed.

(10) *Steel.*—Small lump on steel surface; no marks after painting.

(11) *Coal Lump.*—The coal was partially burned away; large scab on steel surface, surrounded by a smooth groove owing to the volatile gases liberated. Painted sample was almost completely protected by the silica wash.

(12) *Fused Coal Ash.*—Very faintly marked; painted specimen not marked.

TABLE III.—*Percentage Impurities on Basis of the Whole Sand Fraction left on ¼-in. and ½-in. Riddles.*

Sample.	Riddle.	Iron.	Ash.	Coke.	Coal.	Brick.	Frit.	Slag.	Total.
1	¼-in.	2.73	1.29	2.20	0.05	0.18	0.51	0.13	7.09
	½-in.	0.05	0.42	0.30	0.21	0.08	0.27	0.02	1.35
	Total	2.78	1.71	2.50	0.26	0.26	0.78	0.15	8.44
2	¼-in.	1.68	0.00	0.00	0.00	0.00	0.39	0.00	2.07
	½-in.	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.22
	Total	1.68	0.00	0.00	0.00	0.00	0.61	0.00	2.29
3	¼-in.	0.68	0.37	0.87	0.06	0.00	0.50	0.68	3.16
	½-in.	0.00	0.35	0.56	0.17	0.00	0.02	0.09	1.19
	Total	0.68	0.72	1.43	0.23	0.00	0.52	0.77	4.35
4	¼-in.	0.00	0.00	0.00	0.00	0.00	0.89	0.00	0.89
	½-in.	14.56	0.00	0.00	0.00	0.37	1.55	0.00	16.48
	Total	14.56	0.00	0.00	0.00	0.37	2.44	0.00	17.37
5	¼-in.	1.75	0.09	0.00	0.23	0.09	1.72	0.00	3.88
	½-in.	0.00	0.15	0.19	0.00	0.00	0.57	0.00	0.91
	Total	1.75	0.24	0.19	0.23	0.09	2.29	0.00	4.79
6	¼-in.	34.56	0.00	0.00	0.02	0.00	0.34	0.00	34.92
	½-in.	0.02	0.04	0.00	0.01	0.00	0.49	0.00	0.56
	Total	34.58	0.04	0.00	0.03	0.00	0.83	0.00	35.48
Average of 6 samples	¼-in.	6.90	0.29	0.51	0.06	0.05	0.73	0.13	8.67
	½-in.	2.44	0.16	0.18	0.06	0.07	0.52	0.02	3.45
	Total	9.34	0.45	0.69	0.12	0.12	1.25	0.15	12.12

(13) *Sand Frit from Steel Face.*—Faintly marked; painted specimen not marked.

(14) *Sand Frit, Behind Steel Face.*—Practically no effect, slight reaction; same results after painting.

(15) *Unbaked Clay Lumps.*—Steel surface marked slightly; painted specimen was not marked, but the paint cracked round the clay lump, reproducing the outline of the lump on the steel surface.

Consideration of Results

Close examination showed that the worst type of impurity was coal, with slag a close second. The rapid evolution of large volumes of gas, in the first case, and the fusibility of the material in the second, were the chief reasons for the bad effects on the steel. Concrete lumps containing a certain amount of coal or coke also had a deleterious effect on the steel surface; here the low refrectoriness of the concrete would be responsible for most of the effect obtained. White rock lumps were not detrimental, due to the fact that this material is quite refractory, being very highly siliceous. Sand frit and coal ash gave only slight markings on the steel face, while the other impurities, such as clay lumps, rock stone, brick and steel particles, produced definite blemishes, which were, however, not nearly as serious as those obtained with coal or slag. The effect of clay lumps, rock stone and brick will, of course, depend very largely on the chemical composition of these materials and their refractoriness.

Silica paint, it may be mentioned, had a very beneficial effect in either diminishing or eliminating the effect of the impurities on the steel surfaces. With heavier sections than those used for the experiments, the effect of the impurities would no doubt be accentuated.

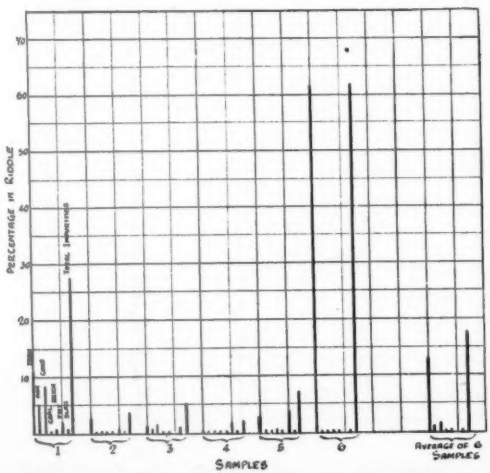

FIG. 4.—KNOCK-OUT SAND. QUANTITATIVE CLASSIFICATION OF IMPURITIES FOUND ON ¼-IN. RIDDLE.

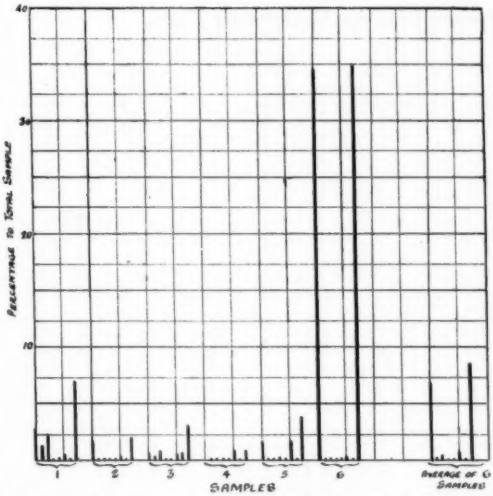

FIG. 5.—QUANTITATIVE CLASSIFICATION OF IMPURITIES FOUND ON ½-IN. RIDDLE, CALCULATED ON A BASIS OF TOTAL SAND SAMPLE.

A Quantitative Examination of Foundry Knock-out Sand

Six samples of sand were collected on separate days from the knock-out of the same foundry. The samples taken were selected from various parts of the heap, to include the extremes of pure and impure sections; this explains the wide range of results obtained. The sampling was carried out in such a manner as to be as closely representative of the whole of the knock-out sand as possible. In the investigation already described, the impurities were specially sought and selected, in order to find all the possible types which were liable to occur, without taking into consideration the proportion to the sand itself, or the possible frequency of occurrence. The present experiment was, however, conducted to ascertain the probable proportion of impurities present in the sand, and their possible recurrence.

The actual samples weighed from 34 to 46 lbs. and each was subjected to a mechanical analysis, to determine the percentage remaining on ½-in. and ¼-in. riddles and on an ¼-in. sieve, and the proportion passing through the ¼-in sieve. The impurities found on the ½-in. and ¼-in. riddles were then picked out, classified, and the proportion of each on the respective riddle was calculated. The grain size of the material remaining on and passing through the ¼-in sieve was too fine to enable the impurities to be accurately picked out and classified. Results of this work are given in Table I.

Examination of Table I and study of Fig. 2 shows that most of the knock-out material either remained on the ½-in. riddle or passed through the ¼-in. sieve.

Impurities in Knock-out Sand

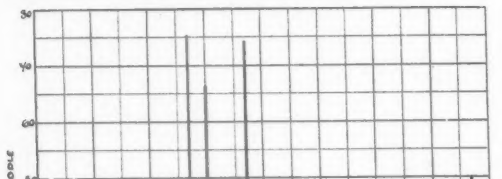

FIG. 6.—QUANTITATIVE CLASSIFICATION OF IMPURITIES FOUND ON ½-IN. RIDDLE, CALCULATED ON A BASIS OF TOTAL SAND SAMPLE.

The proportions in the total samples remaining on the ½-in. riddle and on the ¼-in. sieve were very small, being 5.2 and 3.5 per cent. respectively, giving a total of 8.7 per cent.; 49.1 per cent. remained on the ½-in. riddle, and 42.2 per cent. passed through the ¼-in. sieve.

As far as the actual examination of the impurities is concerned, it has already been stated that classification could not be satisfactorily carried out on the two finer grades, but the proportion of impurities generally remaining on the ¼-in. sieve was found to be very high, although the amount could not be determined. On the other hand, the material passing through the ¼-in. sieve, as far as could be seen, consisted principally of sand, with very little impurity discernible.*

Figs. 3 and 4, together with Table I, show the distribution of impurities on the ½-in. and ¼-in. riddles. Taking the average of the six samples, almost 50 per cent. of the material on the ½-in. riddle (see Fig. 4) consisted of impurities, made up as follows:—On the ½-in. riddle: Iron, 11.6 per cent.; ash, 7.5; coke, 8.9; coal, 3.1; brick, 0.7; frit, 16.9; slag, 1.07 per cent.; total, 49.77 per cent.

As the average amount of material remaining on the ½-in. riddle only amounts to 5.2 per cent., the actual proportion of total impurities to the whole sand fraction is only about 3.5 per cent. Fig. 6 illustrates the proportions of impurities in the ½-in. riddle, calculated to the whole sand sample. The actual figures are as follow:—Iron, 2.44; ash, 0.16; coke, 0.18; coal, 0.06; brick, 0.07; frit, 0.52, and slag, 0.02 per cent. The total of these figures is 3.45 per cent.

The material on the ½-in. riddle contained, on an average of six samples, about 18 per cent. of impurities (see Fig. 3), and on the basis of the whole sand fraction, consisted of 8½ to 9 per cent. (see Fig. 5). The average classification for the ½-in. riddle is given in Table II.

The figures calculated on a basis of the whole sand fraction are set out in detail for both riddles in Table III.

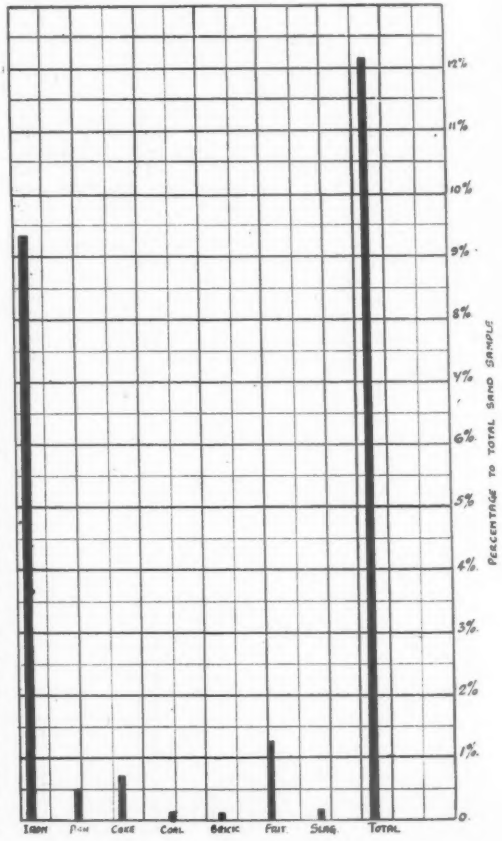

FIG. 7.—QUANTITATIVE CLASSIFICATION OF IMPURITIES FOUND ON (½- AND ¼-IN.) RIDDLES ON A BASIS OF TOTAL SAND SAMPLE (AVERAGE OF SIX SAMPLES).

*Silt and very fine sand were not regarded as impurities for the purposes of this classification. These findings applied to all six samples collected.

TABLE IV.—*Effect of Moisture on Grading of Knock-Out Sand from a Heavy-Castings Foundry.*

Moisture, per cent.	Per cent. remaining on mesh number (B.S.S. test sieves).										Per cent passing 150 mesh.
	8.	10.	16.	22.	30.	44.	60.	100.	120.	150.	
Nil	1.7	1.5	6.1	8.6	15.3	13.2	22.6	18.7	6.8	3.4	2.2
0.7	1.8	1.6	6.0	7.7	11.9	15.1	24.2	20.0	5.6	4.0	2.2
1.4	1.3	1.6	5.8	8.5	12.2	15.0	23.3	20.3	5.4	4.1	2.7
2.0	1.5	1.7	7.1	12.5	11.7	14.0	21.9	17.9	5.3	3.6	2.9
2.6	1.9	2.3	7.8	10.2	13.4	15.6	22.7	18.1	4.5	1.4	2.0
3.0	2.0	3.1	8.0	10.5	14.0	16.8	23.4	17.7	2.8	0.9	0.8
3.3	3.0	3.2	8.6	10.6	13.7	16.7	22.7	17.3	2.3	0.8	1.6
4.1	3.1	3.4	8.0	10.6	15.6	22.8	27.9	6.8	0.3	0.2	0.3
4.8	4.3	4.3	12.3	13.2	25.0	26.2	11.8	2.6	0.2	0.1	0.1
5.6	10.7	5.8	42.9	34.5	4.5	0.8	0.7	0.1	0.1	0.0	0.0

Fig. 7 shows the distribution of impurities on the ½-in. and ¼-in. riddles combined, calculated to a percentage of the whole sand fraction, using all six samples to obtain an average.

These figures are as follow, on ½-in. and ¼-in. riddles (proportion to whole sand fraction):—Iron, 9.34; ash, 0.45; coke, 0.69; coal, 0.12; brick, 0.12; frit, 1.25, and slag, 0.15 per cent. The total of these values is 12.12 per cent.

Examination of Data Obtained

Examination of the results shows that, on the whole, the fractions of the ½-in. riddle and passing through the ¼-in. sieve contain a relatively small proportion of impurities. The two intermediate grades, together amounting to less than 10 per cent. of the total, contain a high percentage of impurities, so that in any system of sand reclamation, these two latter should be discarded. Firstly, magnetic separation of the iron in the whole sand system should take place, after which the remaining material could pass into a double riddling system, composed of a ½-in. riddle and an ¼-in. sieve, and the material remaining between these two could be discarded. Material passing through the ¼-in. sieve could be de-silted and de-dusted by a suction fan. Although most British sand-reclamation plants contain a single riddle or sieve, there is no reason why multiple riddling should not take place to obtain better selection of sand fraction. Dunbeck[5] refers to the use in America of a set of vibrating screens to classify reclaimed knock-out sand.

The impurity present in the greatest proportion was undoubtedly iron. The figures given are calculated on a weight basis; if accurate figures on a volume basis could be obtained, the proportion of iron would be much lower, and the very light fraction, such as ash and coke, would show a considerable increase. These density differences should be borne in mind when reviewing the results obtained.

The second highest impurity was sand frit. On an average, there was, indeed, more of this material on the ¼-in riddle than there was iron. This is true even on a weight basis, in spite of the discrepancy in densities. The next impurities, in order, were coke, ash and slag; coal and brick were present in the least amount.

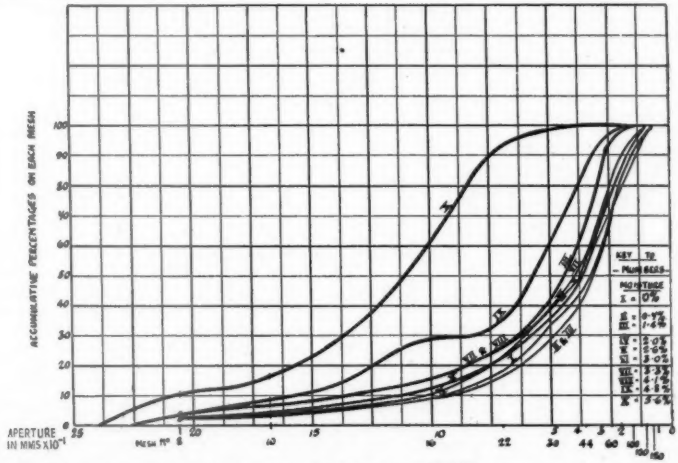

FIG. 8.—EFFECT OF MOISTURE ON MECHANICAL ANALYSIS OF KNOCK-OUT SAND.

Most of the coal, coke and ash particles originate from large cores, whose centres are filled in with ashes, contaminated with coke and coal in various stages of combustion and decomposition. The material passing through the ¼-in. sieve consists chiefly of sand, clay and silt, with very little of the impurities present, and is quite well bonded. The silt and dust, as previously mentioned, should be removed by suction, as they would reduce the refractoriness of the sand, and choke up the mixtures on subsequent re-milling. The degree of shaking in the riddling system would naturally affect the result of the gradings. Either the flat or barrel type of riddle could be used. Probably the best system for reclamation of the large cores would be to specially choose the larger

Impurities in Knock-out Sand

lumps of uncontaminated sand, and wash the remainder to recover only the sand grains.

Effect of Moisture on Grading of Knock-out Sand

The sand samples collected in the previous investigation were free from moisture. However, many foundries water their knock-out sand somewhat, before allowing it to pass on to the reclamation plant. In view of the importance of grading, it was decided to study the question of the effect of moisture on the grading, with a view to arriving at the maximum amount of water which could be added to the dry heap, without materially affecting the subsequent screening operation. As one of the chief purposes of watering the sand is to reduce the amount of dust in the foundry atmosphere, the more that can be added the better. As the fraction passing through the 8-mesh sieve (accounting for over 40 per cent. of the total) supplies most of the dust, and will be affected to a very great extent by water additions, it was decided to study this fraction in detail, together with the fraction remaining on the 8-mesh sieve. The results of this investigation are given in Table IV.

The results are also plotted graphically in Figs. 8 and 9, where the former shows the cumulative percentages

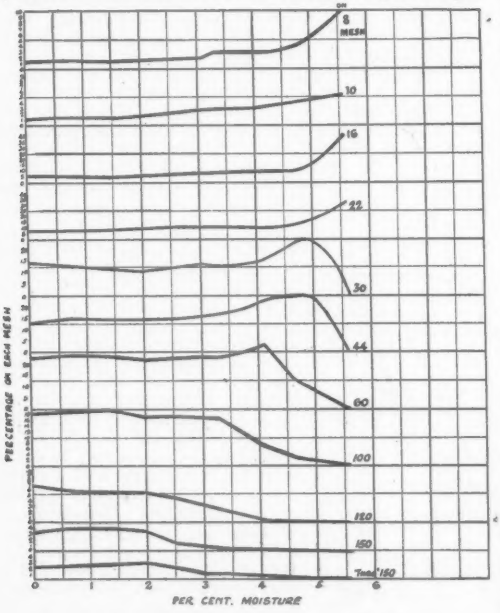

FIG. 9.—EFFECT OF MOISTURE ON MECHANICAL ANALYSIS OF KNOCK-OUT SAND.

of the whole sand sample for each moisture content, and the latter the variation of the fraction on each mesh with increasing moisture content.

Consideration of Moisture Tests

From a review of the results, it can be seen that the sand remaining on mesh Nos. 8, 10, 16 and 22 is practically unaffected until about 5 per cent. moisture is added, when the percentages on these sieves show a sudden increase, especially meshes 16 and 22. This is obviously due to the fact that at 5 per cent. moisture the particles in the finer sieves have clogged together sufficiently to remain on the coarser sieves, and so registering this increase on the latter sieves. Therefore, one would expect to find a drop in the proportion of material remaining on the finer sieves, as the moisture content increases. This is, of course, the case, and little change takes place with mesh Nos. 30, 44 and 60, until between 4 and 5 per cent. moisture is reached, when the amount left on these sieves falls considerably, due to the transference to the coarser sieves, by reason of coagulation of clay and sand particles. Mesh 100 shows the drop at between 3 and 4 per cent. moisture, and the still finer meshes at between 2 and 3 per cent. The finer the sand particles, the easier it is for coagulation to take place. Most of the sand, however, appears in the intermediate sieves, and it can be safely stated that up to 4 per cent. moisture can be added to the knock-out sand, without any material effect on subsequent riddling. This amount of moisture would coagulate the smallest fines, silt and smaller clay particles, and would thus eliminate or substantially reduce the dust problem.

In order to complete this investigation, it was decided to carry out tests with coarse lumpy sand. It was arranged to use ¼-in. and ½-in. riddles and add moisture to the extent of 2½ to 3 and 5 to 6 per cent., respectively, as the previous result showed that these were the critical ranges. The results are shown in Table V.

TABLE V.—*Effect of Moisture on Grading of Coarse Lumpy Sand.*

Moisture, per cent.	On ¼-in. riddle, per cent.	On ½-in. riddle, per cent.	Through ½-in. riddle, per cent.
Nil	46	23	31
2½–3	41	27	32
5–6	25	33	42

The data are also given graphically in Fig. 10. It can be seen that 2½ to 3 per cent. moisture had only a very small effect on the sand lumps, but with 5 to 6 per cent. moisture the large lumps had undergone a greater amount of disintegration, thereby causing more sand to pass through the finer riddle. The lumps, becoming softened with moisture, break up more readily during shaking in the riddle.

Additions of between 4 and 5 per cent. moisture to the knock-out sand should therefore be beneficial in generally helping to soften and break down the larger lumps, and in coagulating the superfine material, thus helping to solve the dust problem. Any moisture over this value would be inadvisable, as coagulation of

intermediate sand grades would take place to such an extent that there would be a danger of clogging up the screening system in the reclamation plant. The moistening of the sand would, of course, lessen the efficiency of the de-silting apparatus, but whether this would have a deleterious effect on the quality of the sand mixture and the castings would be a matter for experiment.

McKinnon[6] writes of water being added for cooling purposes, after which sand passes through a bucket elevator, screen and aerator. He refers to difficulties which may arise in storage, due to moist sand sticking to the hoppers.

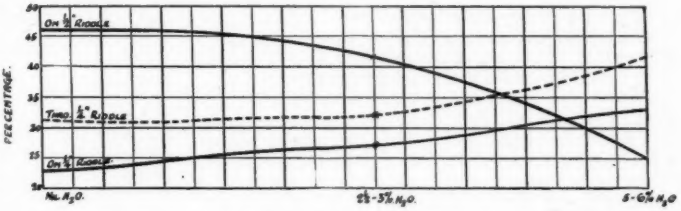

FIG. 10.—EFFECT OF MOISTURE ON COARSE GRADING OF KNOCK-OUT SAND.

GENERAL SUMMARY

Examination of the various types of impurities found in the knock-out sand of a heavy-castings steelfoundry, using dry sand, shows them to be wide and varied in nature. Some of these foreign bodies are highly detrimental to the surface of the casting—notably coal and slag lumps—while others, *e.g.*, white rock lumps, have no evil effect, no doubt due to the refractoriness of this highly siliceous material. At the same time, the ideal facing sand should contain no impurities whatever, as even the least harmful are liable to cause troublesome or even serious defects if they should come into contact with the molten steel. Coal, especially in the form of lumps, is obviously harmful in steelfoundry sand, because of gas evolution, while slag, being less refractory than the steel itself, is liable to melt and float into the steel, giving rise to inclusions and creating a cavity on the surface of the mould from which it came. This would cause a surface defect on the casting. Wilson[7] refers to the fluxing action of iron oxide on the bond of the sand, giving rise to "slag holes." One can therefore visualise the even greater fluxing action which would be caused by the action of iron oxide and slag embodied on the mould face.

Other impurities and their possible effects have also been discussed; in almost every case it is known that a good paint-wash completely eliminates, or greatly reduces, the effect of these materials.

Samples of sand collected from the knock-out, for quantitative classification of impurities, brought out the fact that many of them occurred in negligible quantities only, and that the harmful coal and slag lumps were present in very small proportions. Iron, which is much less harmful, occurs to the greatest extent, followed by sand frit. This latter also is much less harmful than coal or slag.

Accumulation of these impurities must be avoided and a system of reclamation is therefore very desirable, whereby iron is removed by magnetic separation, and the other impurities by classified screening, dust and silt being eliminated from the system by air suction. On the whole, the percentage of extraneous matter in the knock-out sand is low, and most of it is easily eliminated.

As the dust problem often becomes serious, water additions to the knock-out sand should be considered, and it was found that up to 4 per cent. can be added without materially altering the grading. However, the method of adding the water is important, as it must be distributed throughout the sand mass as homogeneously possible, because any concentration of moisture to, say, more than 5 per cent. is liable to cause clogging of the screens in subsequent reclamation.

It cannot be too strongly emphasised here that the results obtained are those from one particular foundry during a limited period of time, and the findings need not necessarily apply universally. Nevertheless, the general principles and practical implications will apply fairly extensively to foundries generally, especially those making steel castings.

Maximum Use of Reclaimed Sand

The question of the use of reclaimed floor sand is an all-important one, and it should be the objective of all foundries to use the maximum amount possible, consistent with preserving the quality of the castings. As steel is much more viscous than cast iron, the problems there involved will be somewhat different. Campbell,[8] writing on surface conditions of castings, refers to the fact that steel is not fluid enough to fill all the minute cavities on the surface of sand cores; cast iron, on the other hand, being more searching, would require the sand surface to be much smoother. One can therefore conclude that coarser sand can be used in the steelfoundry, as compared with the ironfoundry. This should be borne in mind when using reclaimed floor sand for facing purposes either alone or mixed with virgin sand. Steels naturally vary in viscosity, depending on composition and pouring temperature. The distance the steel must travel to fill all the crevices in the mould, and the section of the casting, are also important factors. The use of floor sand should therefore be studied from the point of view of the type if castings for which it is suitable. Many economies can thus be made, virgin sand being used only where absolutely necessary. A good refractory mould wash should also be liberally employed when dealing with floor-sand mixtures in the steelfoundry.

For the list of Bibliographical References see page 302, col. 2.

Correspondence

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

EXECUTIVE RECRUITMENT*

To the Editor of the FOUNDRY TRADE JOURNAL.

SIR,—Ideal qualifications for executives include:—

(1) Ability to handle labour as human beings, yet ensure the best results in quality and output from the team.

(2) Capacity to work and produce the goods in competition with any man on every job in the foundry.

(3) A solid and sound education, including mathematics, mechanical and electrical engineering, chemistry (metals and non-metals), and specialised knowledge on foundry work.

(4) The inborn ability to apply technical knowledge to the work in hand as and when the opportunity occurs.

(5) A sound knowledge of accountancy with specialised knowledge of works costing and the numerous systems of payment by results, including the effects of overhead charges on the various sections of productive work.

(6) Working knowledge of the legal rights of employer and employee.

(7) To know the intricacies of buying and selling.

From the above brief summary "Teak" must realise that when a firm advertises for a recruit for a staff position, it is no easy matter to balance the good points with the weaknesses of an applicant.

In my opinion, it is common practice that when a member of the staff possesses excellent qualifications in some sections of his duties yet is very weak in other sections, the management advertise under a box number to see if a man is available with much better qualifications than either the unsatisfactory party or any other person in their staff who might be promoted. Under these conditions it is not fair to the present occupier of the post that the firm should disclose that they are dissatisfied with his services. Also, a reply to all the applicants could similarly cast a reflection upon the individual concerned. It is a long road to acquire all the desired qualifications.

My advice to "Teak" is, try to fill the conditions applicable to the particular post vacant and then to march on to the next. I hope he succeeds, as there is plenty of room at the top for those who really try.—Yours, etc.,

FOUNDRY OWNER.

*This is a reply to a letter on "Promotion Within the Foundry," published in the JOURNAL March 11, 1948.—ED.

Impurities in Knock-Out Sand

(*Continued from page* 301.)

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[8]H. L. Campbell. *A.F.A. Preprint*, No. 28-30.

Finance Act (No. 2), 1947

Interest Charges for Income Tax.

BY F. J. TEBBUTT

Although income-tax poundages have not been increased by the Finance (No. 2) Act, 1947, there is an important provision which should be noted. By this provision, any tax payable under Schedule D (or Surtax), but not paid, is to carry interest at the rate of three per cent. per annum, from the date when the tax became due and payable until payment is made; but interest did not begin to run until January 1, 1948, and, if tax is paid not later than three months from the due date, interest is not charged.

This means that, as regards any arrears of tax outstanding for more than three months after the tax falls due, interest at 3 per cent. per annum is to be charged as from January 1, 1948, or from the due date if this is later. If a case is under consideration, or has been queried, or there is an appeal undecided, interest will not begin to run until a final assessment has been made.

When interest becomes chargeable, the tax will carry the interest until payment is made. On the other hand, if too much interest has been paid, owing to assessments being lowered by an adjustment, any sum overpaid will be refunded. This new provision applies to assessments made before the passing of the Finance Act (No. 2), 1947 (commencing date, December 18, 1947), and in relation to years of assessment which have ended before that date.

This interest charge, however, only applies where the total tax charged by the assessment exceeds £1,000 and the total amount of interest exceeds £1. Interest payable is not deductible as a trading expense or to be taken into account in computing any income profits or losses for the purposes of the Income Tax Acts (or enactments covering the Profits Tax). Incidentally, this interest charge applies also to assessments for the Profits Tax or Excess Profits Tax.

Netherlands Foundrymen's Association

Yesterday in Utrecht, the Netherlands Foundrymen's Association held a meeting devoted to non-destructive methods of testing. After a short speech from Mr. F. W. E. Spies (the chairman), Mr. Binkhorst, of the X-ray Department at Overschie, dealt with the more theoretical principles. Then followed a Paper by Dr. R. Jackson, of the Steam Engineering Department of the British Coal Utilisation Research Association, on "Radiography in the Foundry." Mr. A. Swagerman, of Dikkers & Company, of Hengelo, then presented a short resume of Mr. Jackson's Paper in Dutch. After luncheon, Mr. L. van Ouverkerk, of the X-ray Institute at Overschie, dealt with the economic applications of X-ray testing. A lengthy discussion followed and the meeting closed at 4 p.m.

Stress-Relief Treatment of Iron Castings*

Report of Sub-Committee T.S. 17 of the Technical Council of the Institute of British Foundrymen.

Synopsis

The I.B.F. was approached by the British Internal Combustion Engine Research Association in connection with a study of stress-relief practice for iron castings. Sub-Committee T.S. 17 was formed, and reviewed the literature, information available in the private records of some members, and data supplied by a number of firms as a result of a questionnaire. Information was collected on technical aspects of the problem and current practices by firms engaged in the production of a number of types of iron castings covering turbine parts, machine tools, chemical castings, automobile castings, engine castings, etc. After a study of the data supplied, the Sub-Committee has drawn up recommendations for practice for full stress relief, and for modified stress relief for stabilising iron castings. Due consideration is given to the possible effects of temperature on the properties of the metal. The report concludes with a bibliography of available information.

Introduction

Sub-Committee T.S. 17—"Stress Relief of Iron Castings"—was appointed by the Technical Council of the Institute of British Foundrymen on September 19, 1945, with the following membership:—Dr. A. B. Everest (Chairman), Mond Nickel Co., Ltd.; Mr. L. E. Benson, Metropolitan-Vickers Electrical Co., Ltd.; Mr. F. Buckley, English Electric Co., Ltd.; Mr. P. A. Russell, S. Russell & Sons, Ltd.; Mr. G. W. Nicholls. Modern Foundries, Ltd.; Mr. A. Phillips, Metropolitan-Vickers Electrical Co., Ltd.

The objects of the Sub-Committee, as quoted in its terms of reference, were, first, to deal with an invitation and questionnaire received from the British Internal Combustion Engine Research Association (B.I.C.E.R.A.), and, secondly, to review present practice in stress relieving of iron castings. It is in fulfilment of these objects that the present report is submitted.

In August, 1945, the B.I.C.E.R.A. circulated a questionnaire form to their members in an endeavour to collect and correlate information on current practice on the stress relief heat-treatment of iron castings. A copy of the form and other documents were passed to the Technical Council of the Institute of British Foundrymen with the suggestion that the views of the Technical Council would be helpful to the B.I.C.E.R.A.

The scope of the interest covered by the questionnaire form was limited in the first place to Diesel engine castings. On the other hand, the form was drawn up in a manner to collect information, not only on heat-treatment for the relief of internal stress but also to cover heat-treatment practice generally as applied to any castings involved in Diesel engine construction. After due consideration the Technical Council felt that the subject was a very wide one and would require careful consideration. Sub-Committee T.S. 17 was therefore appointed, under the terms of reference given above, to consider, in the first place, how best to co-operate with the B.I.C.E.R.A. in reviewing the subject from their angle and, secondly, to look more fully into the whole question of stress-relief treatment of iron castings.

The Committee has now completed its work by reviewing published literature and by approaching a number of firms for information on their current practice in the stress-relief treatment of iron castings. This work has been undertaken with a view to the ultimate drafting of recommendations for procedure in this field. In connection with the Committee's work, particular importance is attached to the publication, in the summer of 1946, of a Paper by one of the Committee members—Mr. P. A. Russell—entitled "Heat-Treatment of Grey Cast Iron for Relief of Internal Stresses."† Certain aspects of the Committee's work as, for example, a review of published literature, are fully covered in Mr. Russell's Paper, and need not therefore be considered in great detail in this report.

Internal Stress in Iron Castings

The existence of internal stresses in iron castings has been recognised for a considerable time. Internal stress may manifest itself by distortion or fracture during manufacture or service. Frequently this occurs during machining, the removal of metal bringing about a re-distribution of stress. If internal stresses are present in a casting, failure in service may occur on the application of moderate service stresses which would otherwise be quite safe.

The incidence of internal stress has been recognised especially in castings for machine tools and for precision machinery generally. Various factors can influence the development of internal stress and, in particular, such stresses are affected by design and foundry conditions, including the cooling rate imposed on the casting. It is also recognized that internal stresses must be given greater consideration in modern high-duty and precision castings.

The requirements of modern engineering practice in demanding irons of higher strength and perhaps of lighter sections with simultaneous demands for stability over a long period of time and the maintenance of a high degree of precision in, say, machine tools, have all focussed increased attention on the question of internal stress. Our increasing knowledge of special properties of cast iron, such as creep, has also an important bearing on the release of stress and the stabilisation of the castings. In this connection, reference

* This report was included in a Symposium on internal stress in metals and alloys arranged by the Institute of Metals and held in London on October 15 and 16, 1947.

†Published in FOUNDRY TRADE JOURNAL, September 5, 1946, page 3.

Stress-Relief Treatment

might be made to the use now being made of the creep properties of cast iron for the rectification of distorted castings by giving them a stress-relief heat-treatment under pre-determined load.

In the past, it has been the practice among engineers to meet any danger of distortion in castings by allowing the castings a long weathering or ageing period. In many cases, machine tool castings, engine cylinders and pistons, and similar components were allowed many months' exposure to the weather in order to obtain stabilisation. Sometimes such treatment was applied to the raw casting and sometimes after rough machining. Such treatment was believed to be beneficial in stabilising the castings.

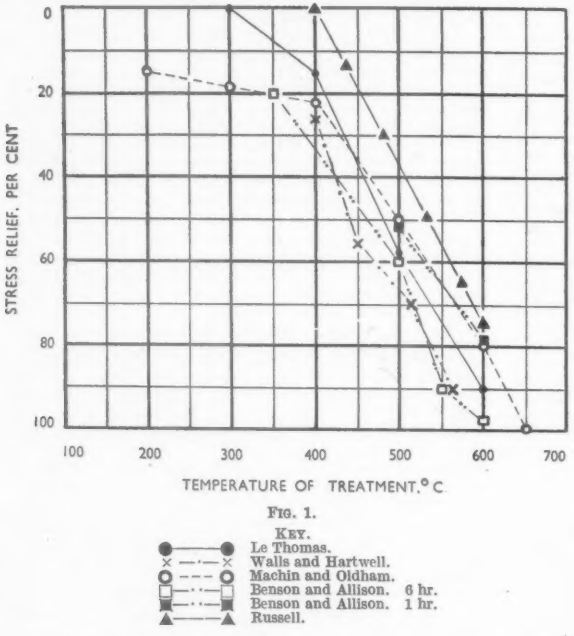

FIG. 1.

It has also been believed that internal stress can be partially relieved by mechanical means such as, for example, vibration or by bumping. Such methods are still held by some to be effective, but their consideration lies outside the scope of this report.

Previous Work

In the study of the effects of internal stress, one of the main difficulties in the past has been the determination of the magnitude of the stresses in any particular part; thus, a casting may show no outward manifestation of internal stress and then suddenly fracture in some member, showing that all the time a stress approaching the breaking load of the material was present. In recent years various authors have studied the question of internal stress, and have devised various methods of evaluating it and determining the effectiveness of heat-treatment in relieving the stress. These studies have led to the conclusion that relatively high temperatures, generally in the region of 600 deg. C., are necessary for the complete removal of internal stress. Such temperatures are frequently well in excess of those which have previously been adopted with success by firms which have experienced trouble from this cause. In the opinion of the Committee, it is necessary to draw careful distinction between treatment necessary for the complete removal of internal stress and treatment which can be applied to make a casting safe so that it will not distort or fracture in service. under current design conditions.

Some makers still practise the weathering of castings for machine tools and other purposes where stability of dimensions is required. Although there is perhaps some evidence that such treatment is beneficial, the experimental data before the Sub-Committee indicate that no appreciable relief of stress can be effected by such means. Stress-relief treatment as described in this report is considered a much more precise and definite method of relieving stresses and, of course, possesses the additional advantage of being rapid.

Work carried out by previous authors is reviewed in Mr. P. A. Russell's Paper.[11] Fig. 1 summarises Russell's findings and those of previous authors.

Effect of Temperature on other Mechanical Properties

In considering the whole question of stress-relief treatment of iron castings, it is necessary to keep in mind the possible effects of temperature on other properties of the iron castings, such as the strength and hardness. Previous workers have studied the effect of temperature on these properties and it is now generally recognised that, with most types of cast iron, the mechanical properties are not seriously impaired on heating to temperatures up to 550 or even 600 deg. C., according to the type of iron. The higher temperature is generally considered safe for high quality irons of the cylinder type or high-duty alloy iron, but above this temperature the strength and hardness of most types of iron will show a rapid falling away. The selection of a suitable stress-relief treatment, therefore, will be determined by the highest economic temperature which can be used for the treatment of the castings without leading to structural change and loss in properties.

Questionnaire Forms

As the interests of the Sub-Committee were somewhat different from those of the B.I.C.E.R.A., a new ques-

tionnaire form was drafted. The new form followed broadly the lines laid down by the B.I.C.E.R.A., but was adapted to cover the wider range of castings in which the Sub-Committee was interested, and to restrict the heat-treatment operations under review to those calculated specifically to give relief of internal stress. This action was necessary, as the original form covered other types of heat-treatment, and in the present review it has been essential to eliminate any reference to annealing for machinability (in which case the structure of the iron undergoes modification) and other types of heat-treatment often called for in connection with special compositions of iron. The form as circulated was calculated to obtain as much information as possible on current stress-relief treatment practice. It covered the types, dimensions, and weight of the castings in question, together with composition of iron used and full details of the treatment given for stress relief. The Committee also asked for evidence supporting the effectiveness of the treatment given and the reasons for its application to any particular type of casting. In the form a request was also made for views on the difficult problem of nomenclature. This last point is of importance, owing to confusion in terms at present applied to the process.

The questionnaire forms were distributed to some twenty-four firms known or believed to be interested in this subject. In this connection, it should be emphasised that, with possibly one exception, no approach was made to firms manufacturing Diesel engines and who were known already to be in communication with the B.I.C.E.R.A. on this subject. In one or two cases the firms approached were users, rather than manufacturers, of castings.

Full details were supplied to the Sub-Committee by twelve of the firms approached, and the data related to some twenty-eight different classes of castings. Data were supplied by some of the other firms but were, in some cases, discarded as they did not bear directly on the subject. Some other firms, including some of the railways approached, indicated that they had no data available.

Summary of Replies on Present Practice with Different Types of Castings

It is difficult to give a concise review of all the mass of information which came to hand as a result of the questionnaire. The following, however, gives some idea of the present practice of individual firms, some of whom admit that the treatment given is limited by the facilities available. It is not suggested that the treatment quoted for any particular application is therefore the best that could be devised.

Example (*a*).—*Makers of Turbine Castings*—including casings, cylinders, valve covers, etc. Sections generally lying between 1 in. and 6 in., and castings made in cylinder type iron (low-silicon, phosphorus, 0.3-0.4 per cent.). These castings are given a stress-relief treatment to eliminate cracking before or in service and to give stability and freedom from distortion at steam temperatures. Two firms use a temperature of 550 deg. C. for 8-10 hr., and a third firm uses 450 deg. C. for up to 24 hr.

Example (*b*).—*Makers of Steam Castings*—including large drain-traps, evaporator headers, etc. Sections of ¼-1½ in. in cylinder type iron. These castings are given a stress-relief treatment of 550-600 deg. C. for 6-10 hr., to avoid cracking in service and to give dimensional stability.

Example (*c*).—*Makers of Machine-Tool Castings*—including lathe beds, gear generator machine beds, gear boxes, etc. Sections ranging from ½-5 in. in various types of iron with phosphorus up to 1.4 per cent. These castings are given a stress-relief treatment at 450-525 deg. C., to eliminate cracking and reduce distortion. One firm claims beneficial results from a stress-relief treatment at 250 deg. C., but indicates that if facilities were available a temperature of 350-450 deg. C. would be preferred.

Example (*d*).—*Makers of Jigs and Face Plate*—Sections ⅛-4 in. in high-duty cast iron, sometimes alloyed. The stress-relief treatment of a special face plate consists of slow heating to 300 deg. C., followed by slow cooling in the furnace, this cycle being repeated three times. For jigs, one firm finds a temperature of 250 deg. C. effective, but would prefer to use a temperature of 450 deg. C.

Example (*e*).—*Makers of Chemical Castings*—including filter drums, evaporator plates, etc. Sections up to 5 in., generally in low phosphorus alloy iron. These castings are given stress-relief treatment to give stability and to help to eliminate corrosion cracking. The usual treatment specified is to heat the castings slowly to 450 deg. C. and hold at that temperature for 10-12 hr.

Example (*f*).—*Makers of Medium Size Compressor and Petrol Engine Castings*—including cylinders heads, pistons, valve bushes, etc. Sections generally of ½-1 in. These castings are usually in high-duty cast iron, and often alloyed. Stress-relief treatment has been found desirable to eliminate distortions; a temperature of 450-550 deg. C. has been proved effective when castings are held at that temperature for about 2 hr. In some cases a temperature of 600 deg. C. is employed, the castings being held at that temperature for ½ hr.

Example (*g*).—*Makers of Large Diesel and Compressor Castings*—including frames, cylinders, liners, heads, pistons, etc. Sections up to 3 in. in high-duty cast iron, often alloyed. Stress-relief treatment is employed to improve the mechanical qualities, to eliminate distortion and to give high stability for high temperature operation. The usual treatment is at a temperature of 530-550 deg. C.; one maker at present uses a temperature of 450 deg. C., but would prefer a temperature in the range 600-650 deg. C.

Example (*h*).—*Makers of Miscellaneous Castings*—Data were also supplied on:—

(i) *Escalator Tracks*—Sections up to 1 in. made in cylinder iron, stress-relieved at 450 deg. C. to reduce distortion.

(ii) *Magnetic Separator Bodies*—Sections between 1 in. and 2 in. in machine-tool iron, stress-relieved at 250 deg. C., but would prefer a temperature of 350-450 deg. C., to eliminate cracking.

(iii) *Brake Races*—Sections ½-1½ in. in nickel-chromium high-duty cast iron, stress-relieved at 530-550 deg. C.

Stress-Relief Treatment

(iv) *Clutch Covers*—Sections ¼-1 in. in nickel-molybdenum high-duty cast iron, stress-relieved at 500-525 deg. C.

(v) *Position Finder Bases*—Sections about 2 in. in nickel high-duty cast iron are given a double treatment consisting of slow heating to 500-525 deg. C., both as cast and after rough machining, to ensure stability of dimensions.

Stress-Relief Conditions

A careful study of the data supplied shows a considerable degree of unanimity in practice. One manufacturer at present employs a stress relief temperature of 250 deg. C. and finds this helpful in eliminating cracking and in stabilising machine tool and general castings. This manufacturer, however, indicates that, if facilities were available, he would prefer to use a temperature in the range 350-450 deg. C. Another manufacturer uses a temperature of 300 deg. C. for the stabilising of a large face plate, as reported above. Apart from these, all the other firms employ temperatures between 450 and 650 deg. C. Five firms specify a temperature of about 450 deg. C., and five a temperature in the range 500-550 deg. C. Two firms use a temperature of 600 deg. C. or over.

Time of Heating

The usual practice is to heat the castings slowly in the furnace and to hold at temperature for 2 or 4 hr. for smaller castings and up to 10 or 12 hr. for large castings. The latter period usually entails approximately a 48-hr. cycle covering several hours for the slow heating to temperature, and several hours for cooling.

Condition of Castings

Stress-relief treatment is usually carried out on the rough castings, but for special cases where a high degree of stability is required the treatment is carried out after rough machining, and indeed in some special cases, where the castings are used for precision purposes, stress-relief treatment is carried out both on the casting "as cast" and after rough machining.

Type of Furnace Employed

Most manufacturers use a muffle-type furnace for stress-relief treatment. Furnaces can be coal-, gas- or oil-fired and, in some cases, are equipped with automatic programme control. In many instances use is made of available facilities, including core stoves. In such cases, however, the temperatures which can be obtained are usually lower than desired. In special cases, particularly in connection with the treatment of small castings, electric furnaces are used.

Effect of Composition

Most of the data supplied in answer to the questionnaire covered the treatment of engineering iron castings, with or without alloys. Little information was provided by the questionnaire on the relationship between composition and stress-relief treatment.

Nomenclature

There is a general consensus of opinion that the term "annealing" should not be applied in any way to the treatment under consideration, and should be reserved for higher temperature operations in which structural change of the metal is involved. The majority of firms who have supplied data are in favour of the term "stress-relief treatment" to cover this operation.

Recommendations

The following recommendations would seem justified in the light of published information and the evidence supplied by firms practising stress-relief treatment.

(1) For full stress relief, it is essential that the castings should be heated to a temperature in the region of 600 deg. C. This recommendation is based largely on published information.

(2) It must be emphasised that some grades of iron, and particularly those in the lower strength classes, will show structural change and deterioration of mechanical properties on heating to temperatures above 550 deg. C. Such loss of strength may not be important when stress-relief treatment is employed to obtain maximum stability in the castings, but when strength is of primary importance due consideration must be given to this factor.

(3) For the elimination of any tendency to cracking or distortion in service there is a considerable consensus of opinion that a stress-relief treatment at 450 deg. C. is sufficient with the factors of safety used in present-day design. It should be understood, however, that at 450 deg. C. stress relief is not complete, and higher service stresses could be safely supported if internal stresses were reduced still further.

(4) For stress-relief treatment, the castings should generally be loaded into a cold furnace, or precautions taken otherwise to ensure slow heating to temperature.

(5) It is essential to allow a reasonable period of time at the temperature to ensure complete relief of stress. The usual rule of allowing at least 1 hr. per inch of section after the casting has obtained full stress-relief temperature throughout is satisfactory.

(6) After holding at temperature, it is desirable that the castings should be allowed to cool slowly for a period of time, but there is no evidence to show that it is necessary to cool down to room temperature in the furnace, and, generally speaking, any temperature below 250 deg. C. would be considered safe for withdrawal from the furnace.

Acknowledgments

Acknowledgment is made to the following firms who supplied data in connection with this investigation:—

David Brown & Sons (Huddersfield), Limited.
English Electric Company, Limited, Rugby.
J. & E. Hall, Limited, Dartford.
Alfred Herbert, Limited, Coventry.
Imperial Chemical Industries, Limited (Alkali Div.), Cheshire.
Metropolitan-Vickers Electrical Company, Limited. Manchester.

(Continued on page 308, col. 2.)

Company News

(Figures for previous year in brackets.)

P. & W. Maclellan—Dividend of 7% (same).

Alexander Stephen & Sons—Interim dividend of 7% (same).

Economic Gas Boiler Company—Dividend of 20% (same).

Thompson Bros. (Bilston)—Interim dividend of 7½% (same).

National Gas & Oil Engine Company—Dividend of 5% (same).

J. Samuel White & Company—Interim dividend of 5% (same).

James Howden & Company—Interim dividend of 7½% (same).

Wallis Tin Stamping Company—Interim dividend of 33⅓% (7½%).

Amalgamated Metal Corporation—Dividend of 5% for nine months (3½% for year).

Midland Electric Manufacturing Company—Dividend of 20% and bonus of 15% (same).

Renold & Coventry Chain Company—Interim dividend of 3% for 40-week period (same).

Parkinson Stove Company—Dividend on the 7% preference shares for two years to March 31, 1946.

Swan, Hunter & Wigham Richardson—Final dividend of 8% and bonus of 4%, making 16% (same).

R.F.D. Company—Final dividend of 6% (same), making 8% (10%) and not as stated in last week's issue.

John Summers & Sons—The board has agreed not to recommend an increased dividend at the annual meeting in May.

Thomas Robinson & Son—Net profit for 1947, £34,425 (£33,776); dividend of 5%, making 7½% (same); forward, £53,331 (£48,906).

J. W. Young & Sons—First report covering 1947 shows net trading profit, £27,118; other income, £700; dividend of 12½%; forward, £1,036.

Consolidated Signal—Net profit for the year ended September 30, 1947, £30,124 (£29,780); dividend of 27% (same); forward, £2,167 (£1,467).

Rugby Portland Cement Company—Group net profit for 1947, £121,613 (£108,723); dividend of 12½% on increased capital (12½%); forward, £140,800 (£120,412).

Coltness Iron Company—Second interim dividend of 2s. 6d. per 15s. share (same), making 21⅓% (same). It is not intended to recommend any further dividend for 1947.

Lobnitz & Company—Net profit for 1947, after taxation and depreciation, £20,467 (£19,922); dividend of 8% (same); forward, £23,113 (£13,508 after £5,000 written off special expenditure).

Waste Heat & Gas Electrical Generating Stations—Net profit to January 31, after taxation, etc., £9,189 (£10,981); dividend of 8% (same); to reserve, £278 (£2,139); forward, £19,044 (£18,934).

Senior Economisers—Profit for 1947, including interest from investments, £40,896 (£30,645), to taxation, £20,000 (£15,169); dividend of 70% (nil); to general reserve, nil (£3,000); forward, £5,496 (£21,383).

Foster, Yates & Thom—Net profit, before tax, for the year ended September 30, 1947, £25,847 (£26,354); to taxation, £14,000 (£12,500); dividend of 5% (same); reserve, £5,000 (£7,000); forward, £2,703 (£2,456).

Small & Parkes—Net profit, £88,488 (£40,983); to general reserve, £30,000 (£15,000); stock depreciation reserve, £9,000 (£4,000); final dividend of 10% and bonus of 10%, making 30% (25%); forward, £40,945 (£23,565).

Clayton Dewandre Company—Net profit for 1947, after tax, etc., £52,156 (£40,506); to general reserve, £7,500 (same); pensions fund, £10,000 (nil); dividend of 12% (same, including bonus of 2%); forward, £20,115 (£18,219).

Hoffmann Manufacturing Company—The directors have declared their intention of not raising the distribution above the 1946 level of 7½%, tax free. Our intimation, in last week's issue, of a dividend statement was incorrect.

Taylor Tunnicliff (Electrical Industries)—Group trading profit and sundry income for 1947, £247,876 (£143,365); to depreciation, £24,600 (£18,626); tax, £139,551 (£76,915); dividend of 15% (12½%); forward, £142,600 (£90,131).

G. D. Peters & Company—Profit for 1947, after depreciation, £93,301 (£82,574); to tax provision, £47,000 (£8,000); staff reserve, £5,000 (same); reserve, £25,000 (£50,000); dividend of 15% and bonus of 2½% (same); forward, £45,374 (£43,691).

Clarke, Chapman & Company—Net profit for 1947, including dividends on investments and after taxation, depreciation, etc., £107,848; dividend of 12½% (same); to pensions reserve, £15,000; general reserve, £25,000; forward, £48,193 (£45,235).

Blythe Colour Works—Net profit for 1947, after depreciation, tax provision, etc., £92,931 (£59,647); to reserve, £55,000 (£20,000); 6% preference dividend, £4,125 (£3,150); ordinary dividend of 50% (same) and bonus of 30% (same); forward, £18,684 (£17,878).

John Baker & Bessemer—Profit for 1947, including dividend from subsidiary, £112,996 (£214,357); to tax, £61,423 (£147,126); dividend of 15% (10% and bonus of 5%); written off capital payments, £5,527 (nil); contingencies, £4,266 (nil); forward, £70,285 (£78,020).

Rivet, Bolt & Nut Company—Profit for 1947, after tax and depreciation, £94,758 (£71,341); to reserve, £10,000 (same); employees' benefit account, £10,000 (£5,000); dividend equalisation reserve, £30,000 (nil); dividend of 15% (same); forward (subject to fees), £13,021 (£13,802).

Josiah Parkes & Sons—Net profit for 1947, after depreciation, taxation, etc., £31,768 (£23,674); surplus on assurance policy, nil (£1,975); final dividend of 8½%

(6% and bonus of 2½%), making 12½% (same); to general reserve, £15,000 (£6.000); deferred repairs, nil (£4,000); forward, £16,178 (£13,160).

Brown Bros.—Net profit for 1947, after providing for taxation and directors' fees, £198,144 (£142,094); to reserve, £25,000 (same); contingencies provision, £25,000 (same); employees' funds, £5,000 (same); final dividend of 17½% (12½% and tax-free bonus of 3%), making 20% (15%); forward, £220,832 (£146,897).

Shanks & Company—Trading profit for 1947, after £66,000 (£40,800) for taxation, £114,999 (£100,268); net profit, after depreciation, etc., £88,773 (£83,415); to special depreciation, £30,000 (nil); pension reserve, £30,000 (£10,000); general reserve, nil (£30,000); final dividend of 12½%, making 17½% (15%); forward, £68,412 (£77,095).

R. B. Pullin & Company—Trading profit for the year to September 30, 1947, £13,784 (£5,711); E.P.T. repayable, £8,000 (£30,000); tax, £31,569, including £20,000 contingent E.P.T. liability in respect of earlier years (£16,859); to general reserve, £10,000 (£5,000); written back to profit and loss account, £5,000; dividend of 10% (12½%).

Enfield Rolling Mills—Net profit for 1947, after charging all expenses, £635,023 (£177,847, after charging £125,000 for deferred repairs and a considerable provision for E.P.T.); interest on dividends and investments, £13,445 (£3,696); to pensions, £20,000 (nil); general reserve, £97,374 (nil); dividend of 5% and bonus of 2½% (same); forward, £53,034 (£175,621).

Barrow Hæmatite Steel Company—Balance from trading account for 1947, including income from investments, £132,670 (£158,869); profit on sale of investments, nil (£9,413); to directors' fees, £2,069 (£1,777); depreciation of fixed assets, £30,000 (£35,000); taxation, £61,000 (£64,000); profit on sale of investments to general reserve, nil (£9,413); net profit, £39,601 (£58,092); dividend of 12½% (same); to general reserve, nil (£15,587); forward, £28,347 (£37,369).

Steel Barrel, Scammells & Associated Engineers—Revenue for the year ended June 30, 1947, £44,804 (£57,474); net income, after miscellaneous expenses, £44,106 (£55,600); tax recoverable, £729 (£433); E.P.T. provision no longer required, £5,000 (nil); to depreciation, £3,500 (same); E.P.T., nil (£1,704); income tax, £20,087 (£25,650); to general reserve, £5,000 (same); general development reserve, £2,000 (same); dividend of 15% and bonus of 5% (same); forward, £5,458 (£5,116).

Brush Electrical Engineering Company—Profit for 1947, £463,213 (loss, £753,680); to depreciation, £119,264 (£88,774); adjustments arising from previous year's contracts, £6,338 (£69,838); net profit, £337,611 (loss, £912,292); no dividend on the ordinary stock (same); to general reserve, £250,000; repaid to an associated company in respect of the half-year's dividend to September 30, 1946, on the preference stock previously paid under guarantee, £5,922; preference dividend for the year to September 30, 1947, £12,704; goodwill written off, £10,001, less share premium account, £8,480; credit forward, £17,972 (loss brought in, £49,492).

Contracts Open

The dates given are the latest on which tenders will be accepted. The address is that from which forms of tender may be obtained.

Cannock, April 17—Castings, etc., for the Urban District Council. Mr. E. Lomax, engineer and surveyor, Council House, The Green, Cannock, Staffs.

Carrickfergus, Northern Ireland, April 3—Providing and laying 500 yds. of 27-in. reinforced concrete and spun cast-iron pipes, etc., for the Urban District Council. Waterhouse & Rounthwaite, 3, Ellison Place, Newcastle-upon-Tyne. (Fee £2 2s., returnable.)

Pershore, April 9—Construction of about 7,900 yds. of 4-in. and 3-in. dia. spun-iron water mains, etc., for the Rural District Council. Willcox, Raikes & Marshall, engineers, 33, Great Charles Street, Birmingham. (Fee £5 5s., returnable.)

Sutton-in-Ashfield, April 12—Gulley grids, cast-iron surface boxes, etc., for the Urban District Council. Mr. I. L. McCallum, engineer and surveyor, Council Offices, Forest Lodge, Station Road, Sutton-in-Ashfield.

Stress-Relief Treatment of Iron Castings

(*Continued from page* 306.)

Modern Foundries, Limited, Halifax.
S. Russell & Sons, Limited, Leicester.
Sheepbridge Stokes Centrifugal Castings Company, Limited, Chesterfield.
C. & B. Smith, Limited, Wolverhampton.
Vickers-Armstrongs, Limited, Barrow-in-Furness.
Westinghouse Brake & Signal Company, Limited, Chippenham.

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10 J. S. Vanick, "Progress in Heat-treatment of Alloy Cast Iron," *Foundry*, 1943, **71**, (7), 90: (8), 96.
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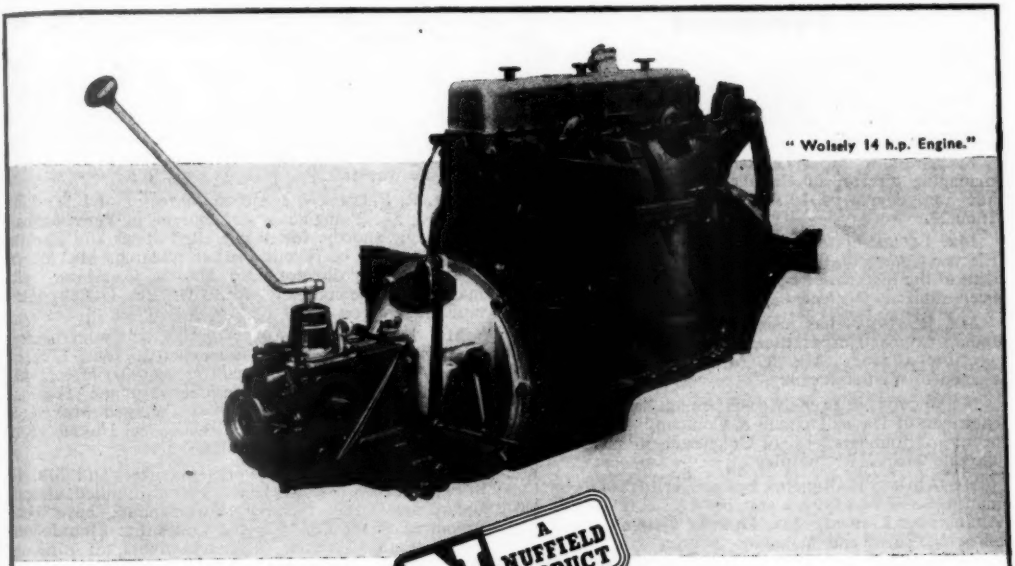
DAMAGES OF £3,174 were awarded against the Foundry & Engineering Company (West Bromwich), Limited, in an action at Birmingham Assizes arising out of the death of Thomas Wilson, a labourer employed by Marshall Sons & Company, Limited, engineers, etc., of Gainsborough, at whose works the defendant company was erecting a large stove, when Wilson received fatal injuries from a falling plank.



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REFINED PIG IRON

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FOR ALL HIGH-DUTY
ENGINEERING CASTINGS

THE STANTON IRONWORKS COMPANY LIMITED, Nr. NOTTINGHAM

Personal

MR. N. R. WILDBLOOD has resigned from the board of Blythe Colour Works, Limited.

MR. O. BERTOYA and MR. W. S. C. TULLY have been appointed directors of the Renold & Coventry Chain Company, Limited.

SIR ANDREW M'CANCE, deputy chairman and joint managing director of Colvilles, Limited, is to receive the hon. degree of LL.D. of Glasgow University on June 23.

MR. LESLIE GAMAGE, vice-chairman of the General Electric Company, Limited, has been re-elected as president of the Institute of Export. The vice-presidents have been similarly re-elected.

MR. R. ANNAN has resigned from the board of the Indian Copper Corporation, Limited, owing to extreme pressure of work; MR. R. M. P. PRESTON has been elected to fill the vacancy.

MR. VICTOR W. BONE, vice-chairman, has been elected chairman of Davey Paxman & Company, Limited, engineers, ironfounders, etc., of Colchester, in succession to the late Mr. G. R. Sharpley.

MR. ARTHUR H. JOHNSON has resigned from the chairmanship and vacated his seat on the board of London Aluminium, Limited. MR. DUNCAN CAMPBELL will become chairman and managing director.

SIR ANDREW DUNCAN is making good progress following an operation. Sir Andrew, who is chairman of the Executive Committee of the British Iron and Steel Federation, has had to cancel a number of engagements on account of his illness.

MR. AND MRS. CHARLES HENRY BUGGINS, of Willenhall, celebrated the 56th anniversary of their wedding on March 13. Mr. Buggins, who is 82, recently retired from the firm of D. Buggins & Sons, lock manufacturers, which was founded by his father.

MR. J. W. BERRY, works director, has been appointed joint managing director with Mr. E. Player, the present managing director, of Birmingham Aluminium Casting (1903) Company, Limited. MR. G. A. RIDER, commercial manager, has been appointed as commercial director of the company.

MR. JAMES D. COWAN has been appointed chairman of Fleming & Ferguson, Limited, shipbuilders, etc., of Paisley, in succession to the late Mr. W. Y. F. Fleming. MR. A. W. PLAYER, a director and manager of the engineering department, has been appointed managing director of the company.

MR. C. ASHLEY MILLER, a director and general manager of G. Beaton & Son, Limited, manufacturers of motor accessories and aircraft components, of Willesden, London, N.W.10, has been appointed managing director of the company. MR. J. G. WIDDOWSON has been elected to the board.

MR. G. HARDMAN has been co-opted to the board of Platt Bros. & Company, Limited, textile and general engineers, of Oldham, and appointed works director at Barton Works, Urmston. MR. H. SHORE has also been co-opted to the board of the company and appointed works director at Hartford Works, Oldham.

MR. E. J. HILL, of London, who for the past 15 years has been the London district delegate for the United Society of Boiler Makers and Iron and Steel Ship Builders, has been elected secretary of the Society in succession to SIR MARK HODGSON, who is retiring. Mr. Hill, who is 47, has been a member of the Society since he was 16.

MR. R. FERGUSON, consultant director of F. Perkins, Limited, Diesel-engine manufacturers, of Peterborough, is leaving shortly for the United States and Canada, where he will carry out market research. MR. W. N. COLLINS, sales director, and MR. R. C. ALLEN, sales manager of the company, are to visit the Utrecht International Fair on April 12.

MR. T. H. SUMMERSON, chairman and joint managing director of Thomas Summerson & Sons, Limited, railway fixed-plant manufacturers, of Darlington, has been nominated for the presidency of the Tees-side Chamber of Commerce. He will succeed MR. C. S. GILL, managing director of Davy & United Roll Foundry, Limited, Haverton Hill-on-Tees.

MR. W. H. MARSTON, works manager, and MR. H. BURKE (recently associated with Elfson, Limited, aircraft and general engineers, of Birmingham), have been appointed to the board of the Concentric Manufacturing Company, Limited, capstan workers, of Birmingham. MR. N. E. HURST has been appointed secretary of the company, as MR. S. G. MORGAN, in view of his increasing responsibilities as a director, is no longer able to combine both offices.

MR H. H. HOLLIS has resigned from his position as chairman and joint managing director of the Oxley Engineering Company, Limited, Leeds, owing to ill-health, but retains his seat on the board. MR. S. STANSFIELD has been appointed managing director and general manager, and MR. H. SAVILLE has been appointed chairman. MR. N. DRYDEN has been elected to the board in place of MR. A. H. JOHNSON, who has resigned owing to pressure of business. Mr. Johnson has also resigned from the board of Rippingilles, Limited, oil-stove manufacturers and sheet-metal workers, of Birmingham.

Wills

CLAYTON, R. D. B., a director of the Cannon Iron Foundries, Limited, Bilston, Staffs £91,838

STEVEN, J. M., a director of A. & P. Steven, Limited, manufacturers of lifts, hydraulic presses, etc., of Glasgow £5,499

BURKE, WILLIAM, chairman of the national committee of the Amalgamated Engineering Union, Doncaster £1,431

WRAGG, R. D., of Thomas Wragg & Sons, Limited, manufacturers of firebricks and fireclay goods, of Burton-on-Trent £100,121

GARTSIDE, VINCENT, late director of John Holroyd & Company, Limited, manufacturers of machine tools and gearing, etc., of Rochdale £11,674

KITSON, H. H., of Leeds, a director of the Monkbridge Iron & Steel Company, Limited (until taken over by the Ministry of Supply), and other companies £88,071

POLLOCK, WALTER, a director of James Pollock, Sons & Company, Limited, shipbuilders, of Faversham, Kent, and a Liveryman of the Worshipful Company of Shipwrights £63,906

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News in Brief

THE NAME OF Kipp Castings, Limited, Croydon, has been changed to Zakkast, Limited.

PEGLERS, LIMITED, manufacturers of steam and water fittings, of Doncaster, announces that it has reduced all its selling prices by approximately 5 per cent.

THE CALEDON SHIPBUILDING & ENGINEERING COMPANY, LIMITED, Dundee, has received an order for a twin-screw motorship for the Orkney and Shetland service.

SHORT BROS., LIMITED, Sunderland, has received orders from foreign owners for two 3,400-ton ships. The engines will be fitted by George Clark (1938), Limited, Sunderland.

SAVINGS GROUPS IN iron, steel, and other metal concerns employing 500 or more people invested £481,304 in National Savings during the quarter ended December last, including £325,400 saved through voluntary deductions from pay.

THE NORTH BRITISH LOCOMOTIVE COMPANY, LIMITED, Glasgow, has received orders for 35 and 75 locomotives of different classes for the British Railways. The company has also received an order for 12 locomotives for the Egyptian State Railways.

ELEVEN EMPLOYEES of Cruikshank & Company, Limited, malleable and cast-iron founders, of Denny, Stirlingshire, with 550 years' combined service, have each received a presentation from the company. One of the recipients was Mr. J. K. Shanks, a former managing director.

VICKERS-ARMSTRONGS, LIMITED, has offered a 5 per cent. increase on basic rates to over 1,000 cranemen and slingers at its Newcastle works. An incentive bonus which, if fully earned, would mean another 15 per cent. increase, has also been offered. The men have rejected the offers.

THE DIRECTORS OF Vulcan Foundry, Limited, Newton-le-Willows, Lancs, have decided that the half-yearly dividend on the 5 per cent. cumulative preference stock shall be paid in future on fixed dates—namely, March 31 and September 30—without waiting for completion of the accounts for each year to December 31.

THE HEAD, WRIGHTSON MACHINE COMPANY, LIMITED, Middlesbrough, a subsidiary of Head, Wrightson & Company, Limited, engineers and founders, of Thornaby-on-Tees, has in hand export orders for machinery to a total value of £75,000. Home orders include a £500,000 contract for a bar mill for a Midlands steel plant.

CRANE PACKING, LIMITED, of Slough, Bucks, which specialises in the manufacture of heat exchanger tube packings, flexible and semi-metallic packings, etc., has been acquired by Tube Investments, Limited. It is planned to extend output capacity to deal with increasing business resulting from the world dollar shortage.

STEEL & COMPANY, LIMITED, ironfounders, engineers, etc., of Sunderland, was recently paid in coffee for equipment sent to Portugal. The arrangement was carried through with the approval of the Bank of England and the coffee, valued at £35,000, was resold to Holland, Sweden, Denmark and Poland in exchange for sterling.

THE COUNCIL OF INDUSTRIAL DESIGN'S new touring exhibition "Design Fair" will be housed in the National Museum of Wales during the Design Week Wales, which will be held in Cardiff from April 12 to 17. The programme for the week also includes, in addition to the conferences for industry, the distributive trades and for the local and education authorities, a housewives' open forum, a delegate conference of youth and the showing of special films.

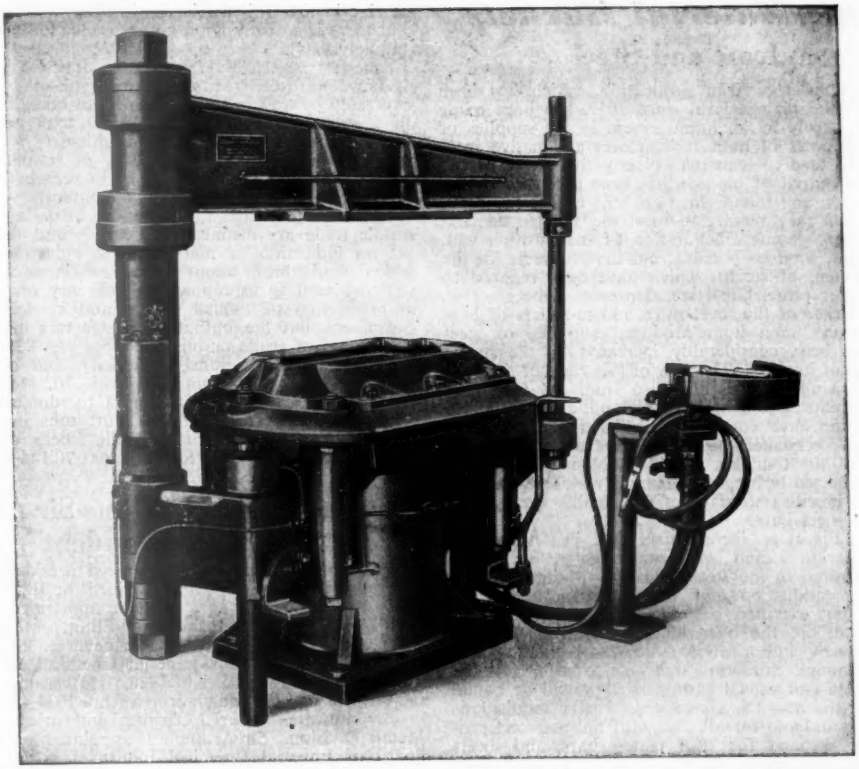
TUBE INVESTMENTS, LIMITED, announces that, as a first step in support of the Government's anti-inflation drive, and to assist customers to reduce home and export prices, the prices of all its electrically-welded tubes, and of all components and products made from them, have been reduced by 2½ per cent. on all supplies despatched as from March 15. An examination is being made into the possibility of reducing prices of other ranges of products.

SPECIALLOID, LIMITED, has appointed Mr. A. F. Eca da Silva, Rua Candido Mendes 105-apto 501, Rio de Janeiro, as resident sales engineer in Brazil. Mr. Eca will be responsible for the interests in that country of Specialloid, Limited, and other manufacturers for whom the company acts as export agents to Brazil. These include the Glacier Metal Company, Limited, Harold Andrews Grinding Company, Limited, Steel-Tite Piston Ring Company, Limited, and Prince (Kingston) Engineers, Limited.

BUT FOR RESTRICTED steel supplies, Vauxhall Motors, Limited, Luton, states, in its annual report, that it could have produced at least 20 per cent. more vehicles and spare parts during 1947. Other material shortages caused almost daily interruptions of production schedules. Nevertheless, total production reached 61,453 vehicles, slightly better than best pre-war years and 15 per cent. higher than 1946. Exports reached a record total of 28,690 vehicles (47 per cent. of total production), which was 25 per cent. better than 1946.

THE NATIONAL UNION OF MANUFACTURERS has thanked the Chancellor of the Exchequer for anticipating the forthcoming Finance Bill and announcing that, as the carrying out of repairs deferred from the E.P.T. period might have to be postponed longer than was anticipated, it was proposed further to extend the time limit to March 31, 1952. The Union regards this as a valuable concession to industrialists, since it will enable them to comply with the Chancellor's appeal to defer expenditure on work of any considerable nature.

SIR PATRICK HANNON, M.P., addressing a Birmingham regional meeting of the British Engineers' Association recently, paid tribute to what he termed the splendid record of abounding vitality in the engineering industry. Statistics showed, he said, that it was making a greater contribution to our overseas trade in these critical times than any other industry. The quality, for which we were famous, was being maintained, and must now be improved. Sir Patrick emphasised the need for safeguarding the interests of the small man in industry.



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Raw Material Markets

Iron and Steel

Expansion of pig-iron production, which has been raised to the highest level since 1917, has been made possible largely by an improvement in the supplies of coke. Imports of both foreign ores and native iron-stone also tend to increase. Nearly the whole of the increased output of pig-iron has been taken up by the steelmakers, and foundrymen are still unable to obtain all the iron they require to meet the swollen demand for castings. Some amelioration of the position will, it is hoped, soon be possible, but the prospects for the replenishment of stocks, which have been reduced to very slender proportions, are at present remote.

Dependence of the sheet mills and re-rollers of bars and sections upon home-produced supplies of steel semis has been considerably increased by the steady shrinkage of imports. The flow of this class of material from the United States and also from the Continent has been reduced to a mere trickle and, although hopes of expansion have not been abandoned, the assistance of British steelmakers has been enlisted. Definite expansion of the tonnages of billets, blooms, and sheet bars is reflected in bigger outputs of re-rolled material, but there is still a shortage of the smaller-sized billets and light sheet bars.

Easter falls at an inconvenient date just before the end of Period I and will, consequently, be almost wholly ignored in the steel industry. Maintenance of maximum production and the clearance of orders, which if not executed before March 31 are due for cancellation, are the over-riding imperatives. Thereafter, the new authorisation system will operate, and, anxious though producers may be to cater for the needs of old and valued customers, they will be bound to honour the new I.S. allocations. Heavy requisitions are already in hand for all classes of finished-steel products, the demand for steel plates, bars, and sheets being especially urgent. Use of steel arches and props in the mines has been widely extended and big tonnages are also requisitioned for the manufacture of wagons.

Non-ferrous Metals

When the Ministry of Supply announced that it was necessary to cut supplies of zinc to the galvanising industry by 10 to 20 per cent., the decision aroused resentment, but also surprise, for it was generally understood that the G.O.B. brands in common use for galvanising were in better supply than electrolytic, or high grade, of which such large tonnages are consumed in the brass trade. There has certainly been a considerable volume of protest and it seems that the authorities have taken stock of the situation, for there has been a remission of the sentence, and the 20 per cent. cut is restored until further notice. The Non-ferrous Control is to be congratulated on overcoming the difficulties which confronted it when the cut was decided upon, for this is certainly no time to reduce the flow of raw materials to industry. Stocks of zinc in the United Kingdom are certainly not large, but there is a fairly good home production which, fortunately, has not been upset by fuel shortages as it was 12 months ago. The 7 per cent. reduction in copper is now in force, but no particular dismay is being expressed by traders at the prospect of being held down to a share in the country's 30,000 tons per month. There is, however, some fear that this may prove to be the beginning of a scaling down of supplies to the country dictated by the inability to secure the necessary foreign exchange to facilitate imports.

In the United States the conditions in the non-ferrous metals trade are distinctly favourable and there is as yet no indication of that break in industrial activity which would bring about a recession in prices. The statistics relating to copper for February reveal a fall in production of refined copper and in deliveries to consumers, but the output of blister was maintained. Production of crude or blister copper was 83,051 short tons, against 82,516 tons in January, and of refined copper, 93,588 tons, compared with 102,314 tons in the previous month. Deliveries to domestic consumers declined from 118,855 short tons in January to 106,823 tons in February, while stocks of refined copper were about 1,400 tons down at 70,146 tons.

Institute of Metals Elects Sir Arthur Smout as President

Sir Arthur Smout has been elected president of the Institute of Metals. In 1905 he joined the Elliott group of metal companies as a student apprentice. From 1920-24 he was works manager of Elliott's Metal Company and from 1924-46 works manager to the group, which was merged into Imperial Chemical Industries, Limited, on its formation in 1926. He became managing director in 1934 and chairman from 1934-42 of what is now known as Imperial Chemical Industries, Limited, Metals Division. Sir Arthur was appointed to the main board of Imperial Chemical Industries in 1944, with responsibility for the company's metal and ammunition interests. He is also a director of Magnesium Elektron, Limited, Murex, Limited, Murex Welding Processes, Limited, and Pyrotenax, Limited.

Much of Sir Arthur's time has been devoted to public service and to the advancement of science and industry. He is chairman of the Non-ferrous Metals Industry Standards Committee of the British Standards Institution, vice-president of the Institution of Mining and Metallurgy, and a member of Council of the British Non-ferrous Metals Research Association, the British Welding Research Association, and the Copper Development Association.

Sir Arthur was elected a member of the Institute of Metals in 1917. He was a member of Council from 1924-36, and 1937-40, a vice-president from 1940-43, a member of Council from 1945-46, and again a vice-president from 1946 until his election as president. He has served on many committees of the Institute and notably in the most important role of chairman of the Finance and General Purposes Committee from 1946 until assuming the presidency.